Photo by Linda Weintraud

"Hit this glove with a karate strike," Bruce Lee of jeet-kune-do said to Mel Yoshioka of shotokan karate.

"Blap!" The force barely moved Bruce's arm upward.

"Hmmmm, not bad," Bruce told him as he took off the karate striking glove and handed it to Mel. "This time you put it on and hold it while I strike it."

"KRACK!" Mel's arm was flung back, twisting the upper part of his torso in an 180-degree turn.

"Wow! What happened! How can a punch carry so much force?" exclaimed Mel.

As anyone in the martial arts knows, there is a right way and a wrong way to execute a technique. In order to gain maximum efficiency in a punch, there are certain principles that should be followed and an understanding of the physical anatomy of a punch is helpful in making it as effective as possible.

The body mechanisms for movement are bones and muscles. The bones are moved by an estimated 270-million striated muscles. There are certain muscle groups that should be utilized to attain maximum impact in the punch and there are certain muscles that should be relaxed to aid this process. The timing of the use of these muscles determines the type of motion which results.

The lifting of one's arm seems like it is very easy and is an every day occurrence. The repetition and constant use in speci-

POWER IN THE PUNCH

BY HAYWARD NISHIOKA

EVER THE STICKLER FOR REALISTIC TRAINING, Bruce Lee connects with a right cross to the jaw of a student. Few people outside the martial arts realize the amount of force which Bruce has developed in his punches by applying kinesiology to jeet kune do.

fied movement patterns makes it possible for us to lift our arms without having to give the action a second thought. When taking a closer look, however, we find that the muscles are responsible for moving the bones. For our purpose we will classify these muscles into two groups: *agonists*, those muscles which perform the desired action; and *antagonists*, those muscles that may hinder the desired action.

For example, the biceps are muscles that are primarily used in pulling. The action of the triceps are that of pushing. When pushing an object, the desired action is to force the object away. Therefore, the triceps become the agonist and the biceps become the potential antagonists. In pulling the opposite is true. The biceps become the agonists and the triceps become the potential antagonists. Each of the three joints and the three muscles have agonists.

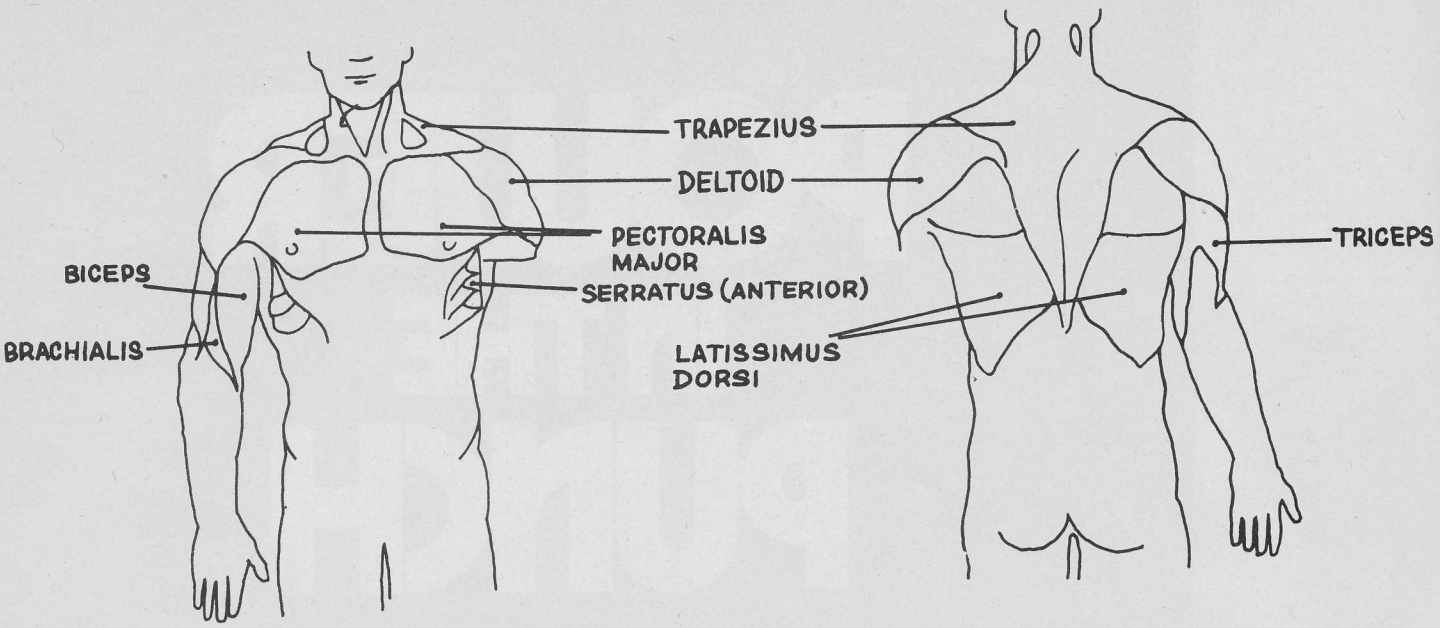
Concentric contraction, according to *Kinesiology and Applied Anatomy* by Rasch and Burch, is "when a muscle develops tension sufficient to overcome a resistance, so that the muscle *visibly* shortens and *moves* a part of the body in spite of a given resistance."

Eccentric contraction, according to the same author, occurs "when a given resistance *overcomes* the muscle tension so that the muscle actually *lengthens*."

Two types of physical activity were tested by measurement on the electromyogram. The subject was connected to the electromyogram by electrodes (see photograph), joined to the belly of each muscle. The following three joints and three muscles in each of the joints were tested. Shoulder joint: pectoralis major muscle; anterior deltoid muscle; latissimus dorsi muscle. Shoulder girdle: serratus anterior muscle; trapezius II muscle; trapezius III muscle. Elbow joint: biceps brachi muscle; biceps brachialis muscle; triceps brachi muscle.

Each of the muscles in each of the three joints listed above were tested by using a punch which employed karate striking techniques. These same muscles and joints were then tested by using a punch which employed jeet-kune-do technique. The two types of striking techniques were compared by measurement of muscle activity on the electromyogram.

When the muscles of the shoulder joint were tested, all three of them showed the greater amount of activity with jeet-kune-do technique. Karate technique proved to give the greater amount of activity on all three muscles of the shoulder girdle. In the elbow joint the biceps brachii muscle had the greater activity with karate, while the other two muscles in this group, the



INTENSIVE STUDY of this illustration will help clarify the graphs on the opposite page. A total of eight muscles were recorded, however, there are two trapezius (II and III) readings. Both types of punches used all of the muscles at one time or another, but the greater tension noted before and after impact with karate leads to belief in karate's calisthenic value.

brachialis and triceps, measured greater activity with jeet-kune-do.

The karate strike utilized both agonistic and antagonistic muscles in punching, thereby neutralizing the effectiveness of the impact upon the punching glove. Most of the antagonistic muscles contracted eccentrically in the karate punch. The latissimus dorsi, trapezius II and III, and the biceps brachii and brachialis all showed tension long before impact.

Jeet-kune-do, on the other hand, showed less eccentric contraction of the antagonistic muscles before impact. Jeet-kune-do utilized ballistic (propelling the fist at maximum speed) type movement to impart maximum force. It was observed, however, that jeet-kune-do did contract muscles concentrically and eccentrically on both the agonistic and antagonist muscles at the point of impact.

Although the jeet-kune-do punch proved more effective in striking power, the karate type of punch was more effective as a means of exercise and physical development as more muscle mass was being used.

The ideal situation is to have different methods of striking for different occasions. Sensei Egami, shotokan professor at Gakushuin University (Tokyo Imperial University), had this to say about punches: "It is a mistake to think there is only one type of hitting and striking. There are punches that can go through the body, there are punches that seem to explode inside the body, and there are punches that only hurt on the surface. There are also punching exercises that can be used to develop the physical, but there are also punching exercises that can develop the man within one's self."

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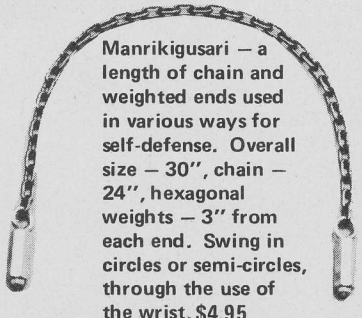

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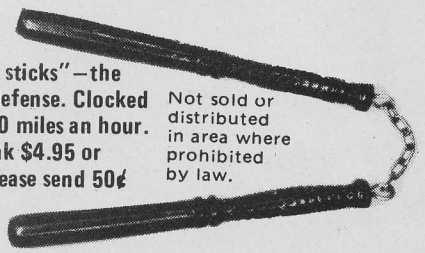

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